

When GRID meets Cloud

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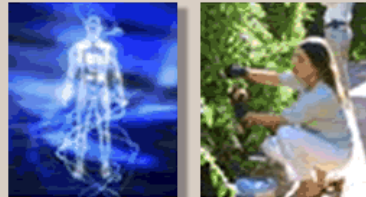


Industry Requirements



Shorten Time-To-Market

Raise Product Quality



Integrate Design Processes

Reduce Development Costs



SynfiniWay

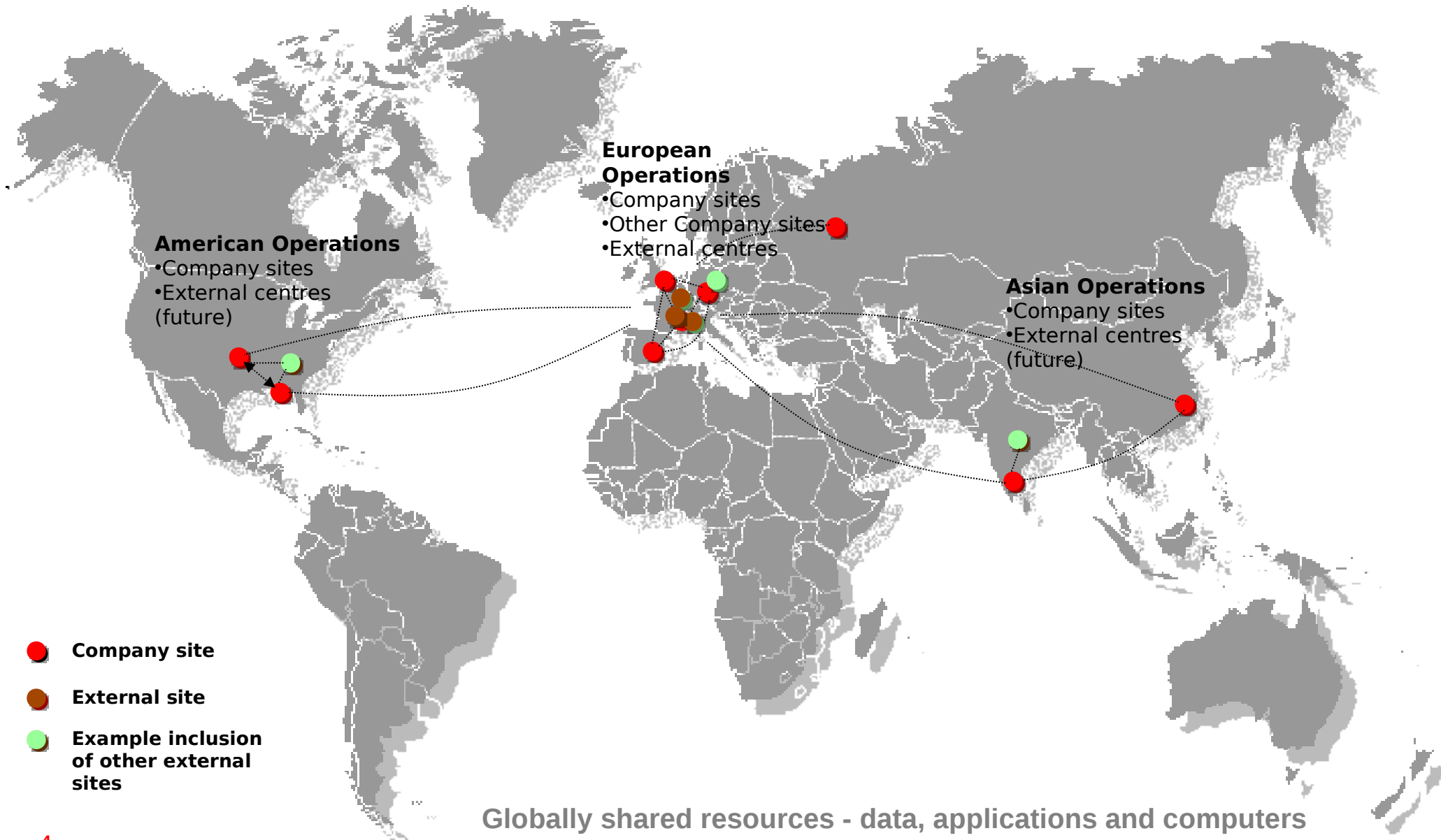


Calculation Grid IT Infrastructure

What is SynfiniWay

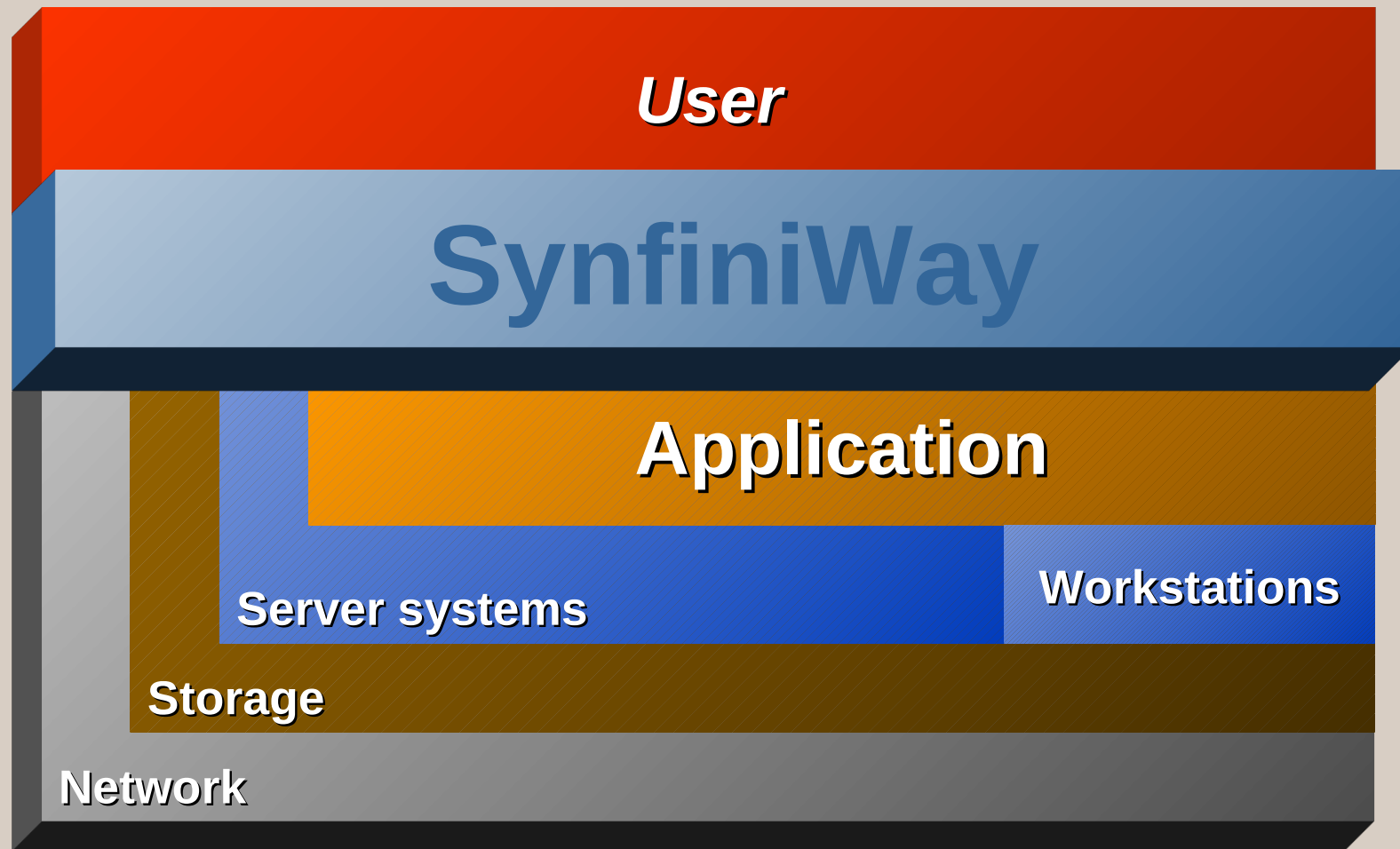
- ✓ SynfiniWay is **an SOA IT framework** for distributed computing relevant to global organisations
- ✓ A **Middleware** that overcomes barriers to organisational and process scale by reducing global IT complexity
- ✓ Enables the secure and cost effective use of **distributed infrastructures** between organisations
 - ✓ Applications and data may be situated on any of the distributed infrastructures
 - ✓ Access computing power necessary to run each element independent of location/ownership
- ✓ Whole workflow completed within a **virtualised** and adaptable environment that avoids the inefficiencies, waste, and data loss normally associated with **increasing scale**

Ability to build a truly global Extended Enterprise

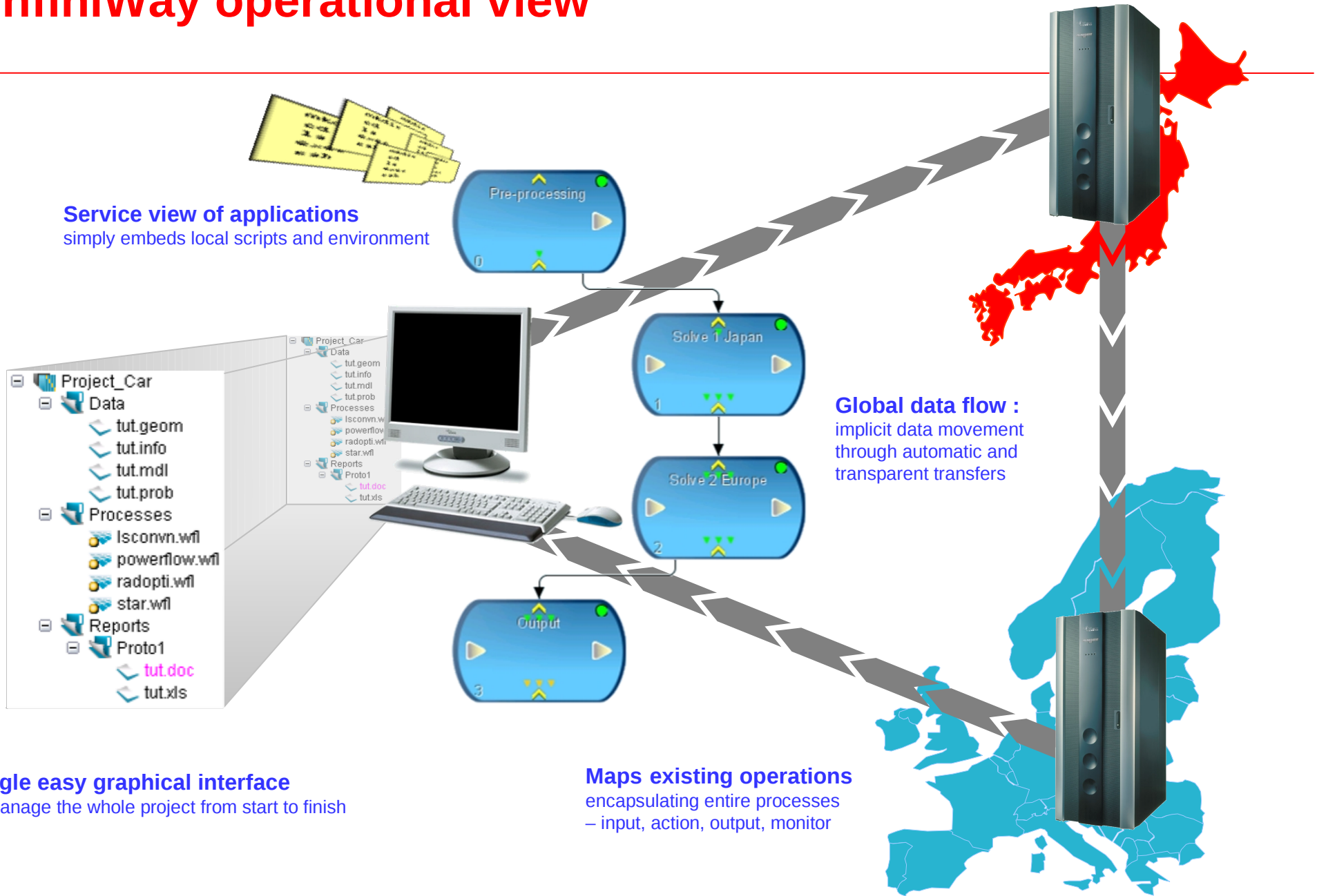


Position in the resource landscape

SynfiniWay is the interface between end-users and the IT infrastructure

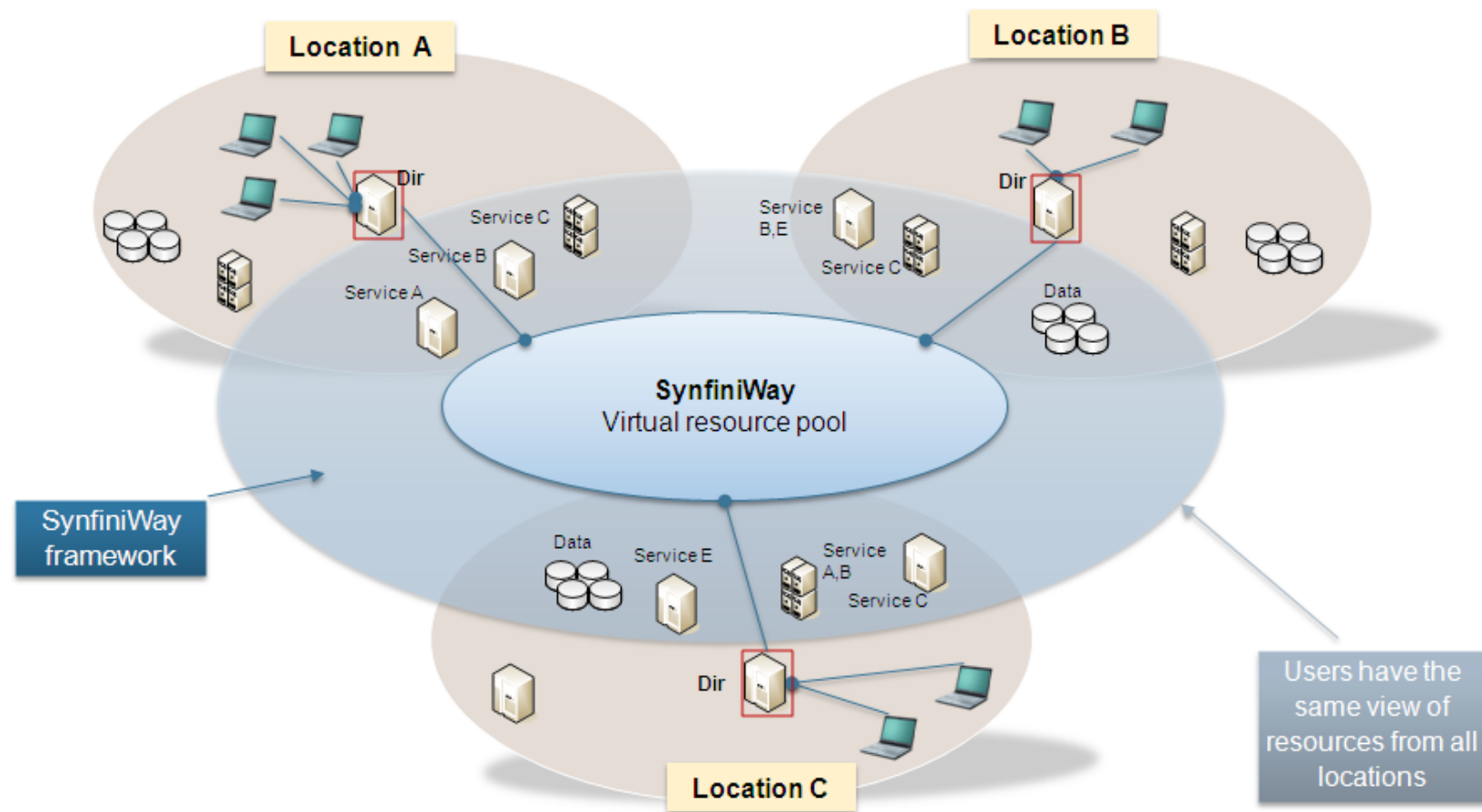


SynfiniWay operational view



Global IT Virtualisation

- Network abstraction
- Service-based application abstraction
- Security distributed, global user identity
- Workflow engine for global orchestration
- Scheduler based on limits/tags
- Direct implicit data transfer



Framework Concept

GENERAL APPLICATION ARCHITECTURE

Process Management

Data Management

SynfiniWay

Authentication	Workflow engine
Authorisation	Meta-workflow
Accounting	Meta-scheduling
Traceability	Data exchange

Data Services

Compute Services

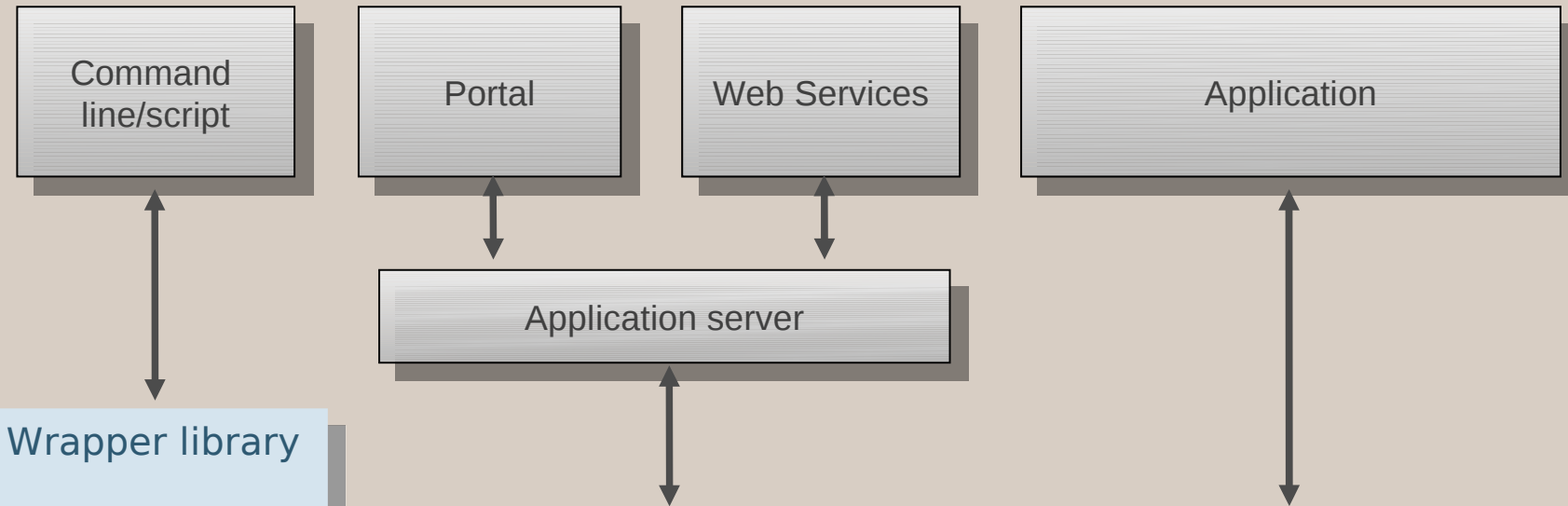
Infrastructure

Local batch management
File system management

System administration
Firewall security

Connections to SynfiniWay Framework

SUPPORTED TECHNOLOGIES



Wrapper library

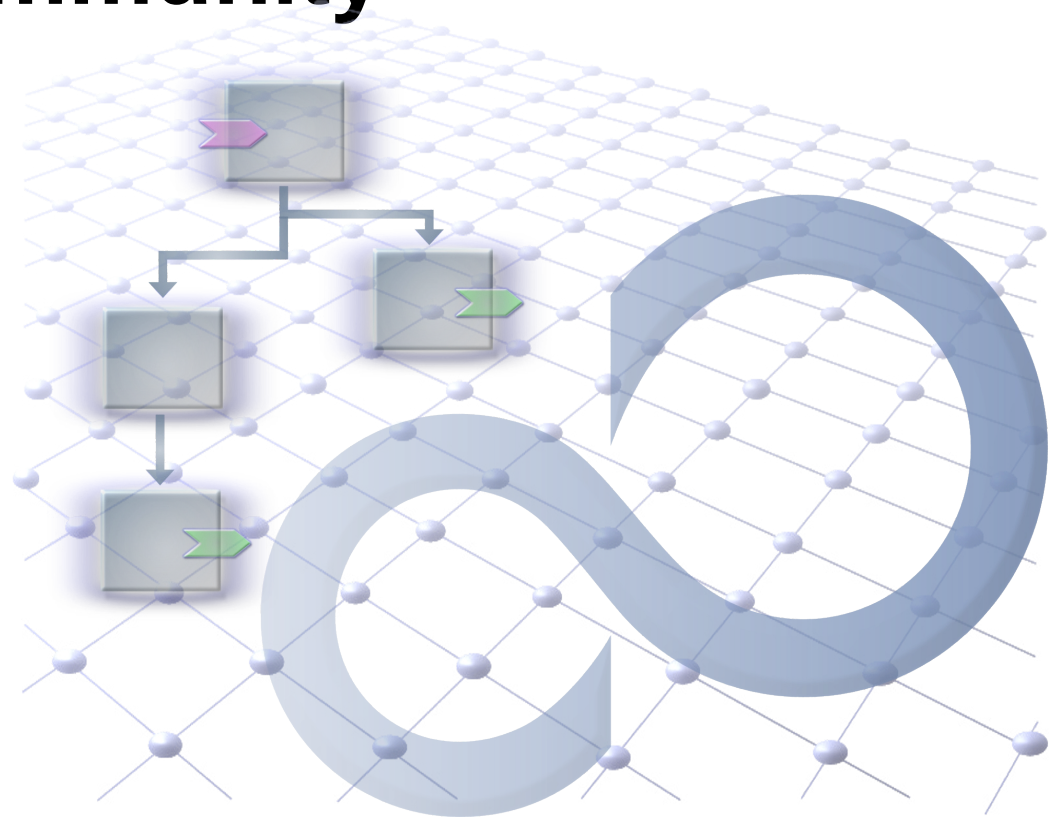
SynfiniWay API

SynfiniWay core

Data Services

Compute Services

The SynfiniWay Community and Components



Main concepts

- **Service** - defines a logical group of actions related to an application (user or system)
- **Action** - defines how a piece of software is executed
- **Workflow** - a set of tasks managed as a single unit
- **Task** - a service action – instantiation of an action
- **Workspace** - private or shared, defined on the director used to hold projects, workflow definitions and related data
- **Run Directory** - Dynamic work area used running services for users

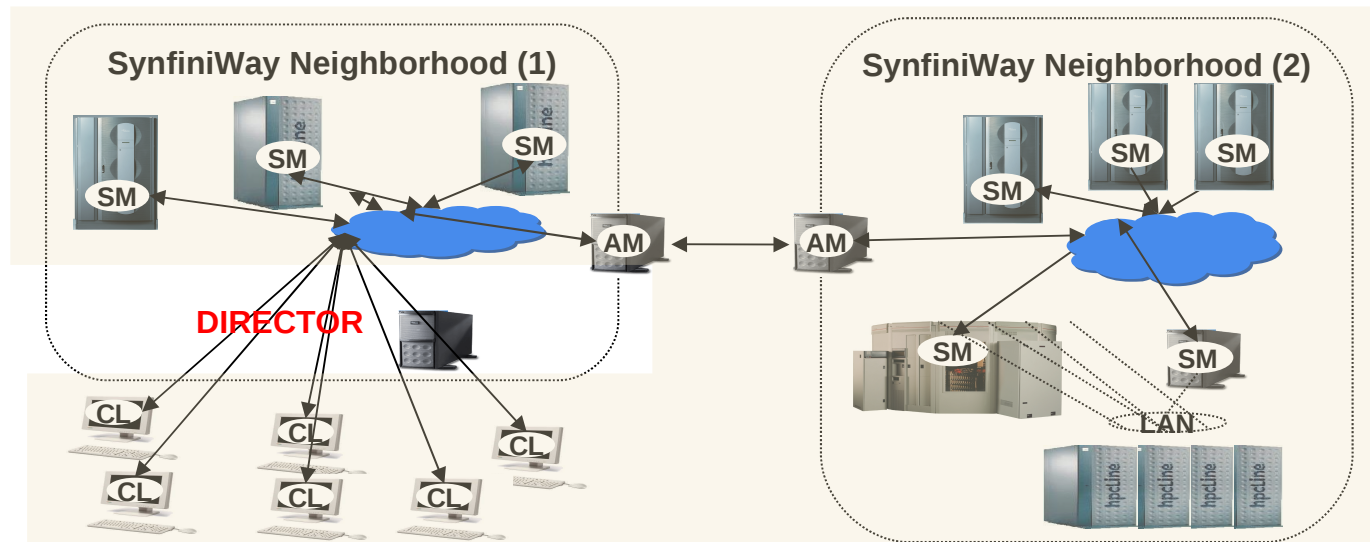
Main components

- Server systems
 - Director(s)
 - Service Managers
 - Acquaintance Managers
- Clients
- Community
 - The global set of resources under the control of SynfiniWay
 - Server systems
 - Storage areas
 - Clients
 - Consists of one or more neighbourhoods
- Neighbourhood
 - A distinct set of server systems with local network connection between each other
 - Includes at least one Service Manager

Director

- Manages user connections
- Manages user projects
- Provides user workspace (storage for projects, workflows and data)
- Workflow scheduling and management
- Manages data transfer requests
- Discovers available Service Managers
- Discovers and maintains a list of published services

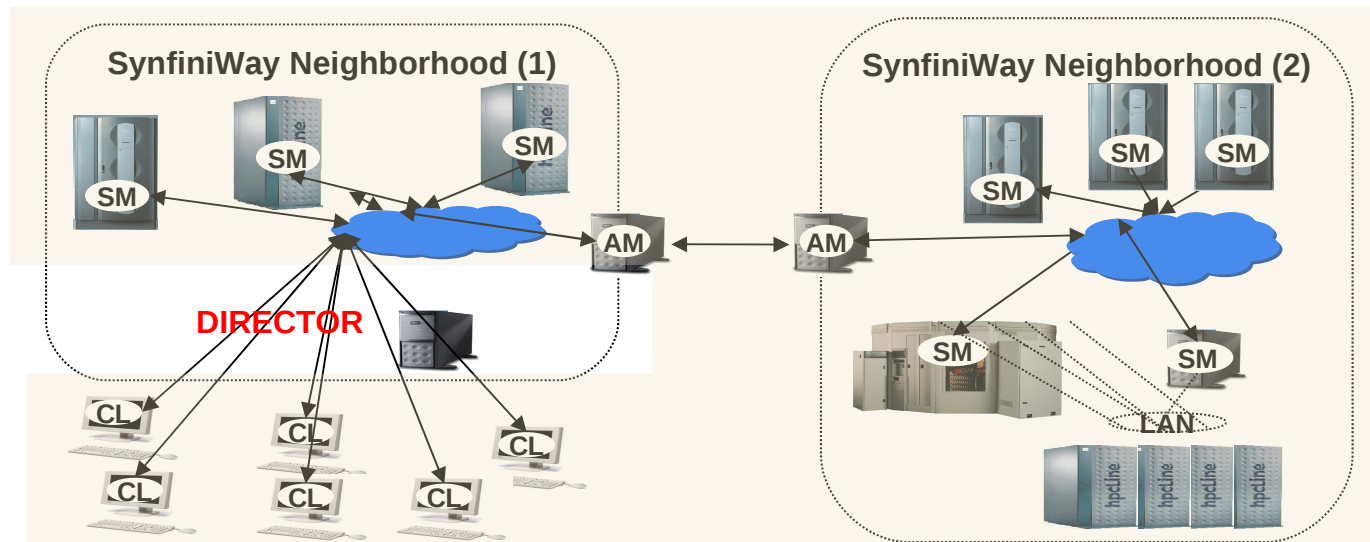
CL: Client
SM: Service Manager



Service Manager

- One required per cluster or server where services need to be used
- Defines the services available from this host
- Can export directories for access by users
- Interfaces to system services
- Can be dynamically added

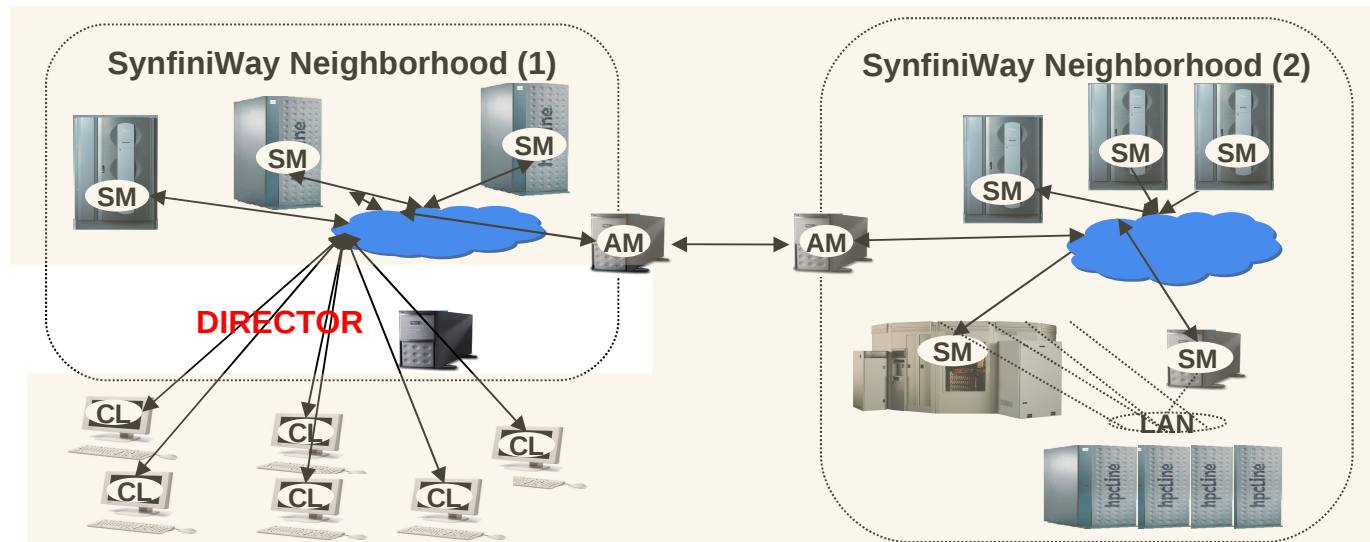
CL: Client
SM: Service Manager



Acquaintance Manager

- Links multiple neighbourhoods together
- Transparent propagation of service discovery mechanism
- One per neighbourhood
 - handles connection to all other neighbourhoods
 - Can use unencrypted or SSL encrypted links

CL: Client
SM: Service Manager



SynfiniWay desktop

The screenshot displays the SynfiniWay desktop environment. On the left, a 'Project list' pane shows a tree view of projects including 'demo', 'delta', 'omega', and 'support_fse5019'. The main workspace is a 'Graphical workflow display' showing a sequence of tasks: Task 01, Task 02, Task 03, Task 04, Task 05, and Task 06. Task 03 is highlighted with a dashed box and a green callout box labeled 'Executing in Paris'. Task 04 is also highlighted with a dashed box and a green callout box labeled 'Executed in London'. At the bottom, a 'Task status' bar shows 'Task 03' with a status of 'WAIT_FOR_INPUT' and a timestamp of '2004-02-13 13:35:28'. On the right, a 'Workflow status' console displays a table of task execution logs.

Date	Name (Id)	State
1 2004-02-13 13:33-18	Task 04 (184:4)	WAIT_FOR_INPUT
2 2004-02-13 13:35-28	Task 03 (184:2)	WAIT_FOR_INPUT
3 2004-02-13 13:32-42	Task 02 (184:3)	WAIT_FOR_INPUT
4 2004-02-13 13:33-02	Task 02 (184:3)	WAITING
5 2004-02-13 13:35-13	Task 01 (184:1)	WAITING
6 2004-02-13 13:32-42	Task 02 (184:3)	WAITING
7 2004-02-13 13:33-18	Task 04 (184:4)	WAITING
8 2004-02-13 13:35-28	Task 03 (184:2)	WAITING
9 2004-02-13 13:34-33	Task 04 (184:4)	WAITING
10 2004-02-13 13:35-23	Task 01 (184:1)	RUNNING
11 2004-02-13 13:34-43	Task 04 (184:4)	RUNNING
12 2004-02-13 13:33-12	Task 02 (184:3)	RUNNING
13 2004-02-13 13:34-38	Task 04 (184:4)	QUEUED
14 2004-02-13 13:33-07	Task 02 (184:3)	QUEUED
15 2004-02-13 13:35-18	Task 01 (184:1)	QUEUED
16 2004-02-13 13:33-18	Task 04 (184:4)	PENDING
17 2004-02-13 13:35-28	Task 03 (184:2)	PENDING
18 2004-02-13 13:32-47	Task 02 (184:3)	PENDING
19 2004-02-13 13:34-48	Task 04 (184:4)	OUTPUT_IN_PROGRESS
20 2004-02-13 13:33-18	Task 02 (184:3)	OUTPUT_IN_PROGRESS
21 2004-02-13 13:33-18	Task 02 (184:3)	OUTPUT_IN_PROGRESS
22 2004-02-13 13:34-48	Task 04 (184:4)	OUTPUT_IN_PROGRESS
23 2004-02-13 13:35-28	Task 01 (184:1)	OUTPUT_IN_PROGRESS
24 2004-02-13 13:35-28	Task 01 (184:1)	OUTPUT_IN_PROGRESS
25 2004-02-13 13:33-17	Task 02 (184:3)	ENDING
26 2004-02-13 13:35-28	Task 01 (184:1)	ENDING
27 2004-02-13 13:34-48	Task 04 (184:4)	ENDING
28		ENDED
29		ENDED
30		ENDED

WEB Portal

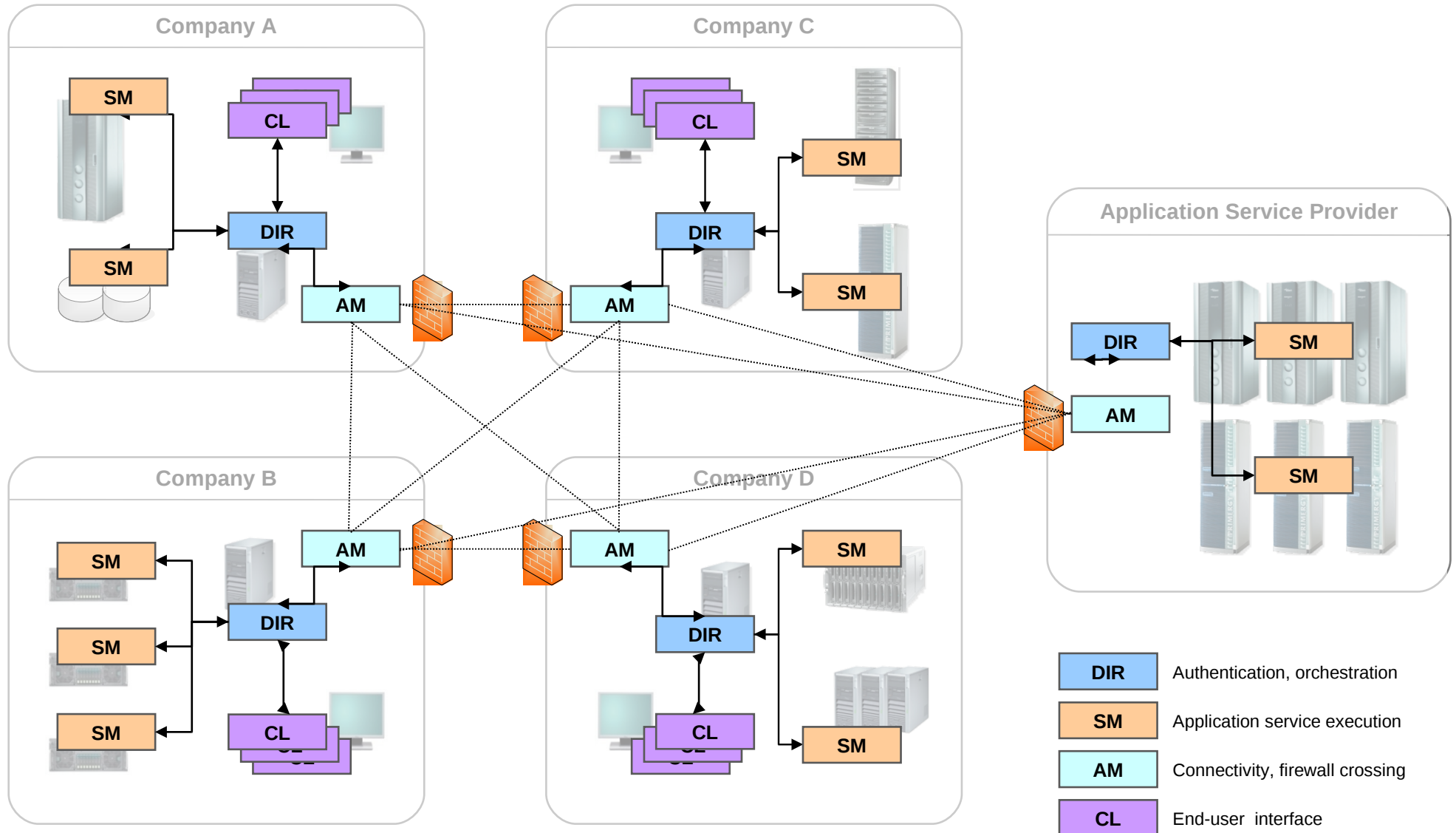
Workflows

Project	Id.	Name	Start	Status	Stop	
Project: 407 (3 Items)						
407	7	Crash	04/09/2007	Completed		<input type="checkbox"/>
407	8	CFD	01/08/2009	Active		<input type="checkbox"/>
407	9	Noise	11/10/2007	Completed		<input type="checkbox"/>
Project: 307 (3 Items)						
307	4	Crash	04/09/2007	Active		<input type="checkbox"/>
307	5	CFD	04/09/2007	Aborted		<input type="checkbox"/>
307	6	Noise	04/09/2007	Completed		<input type="checkbox"/>
Project: 207 (3 Items)						
207	1	Crash	04/09/2007	Active		<input type="checkbox"/>
207	2	CFD	04/09/2007	Active		<input type="checkbox"/>
207	3	Noise	04/09/2007	Canceled		<input type="checkbox"/>

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A Real SynfiniWay IT Framework

CONCEPTUAL ARCHITECTURE – SOFTWARE AGENT-BASED TECHNOLOGY



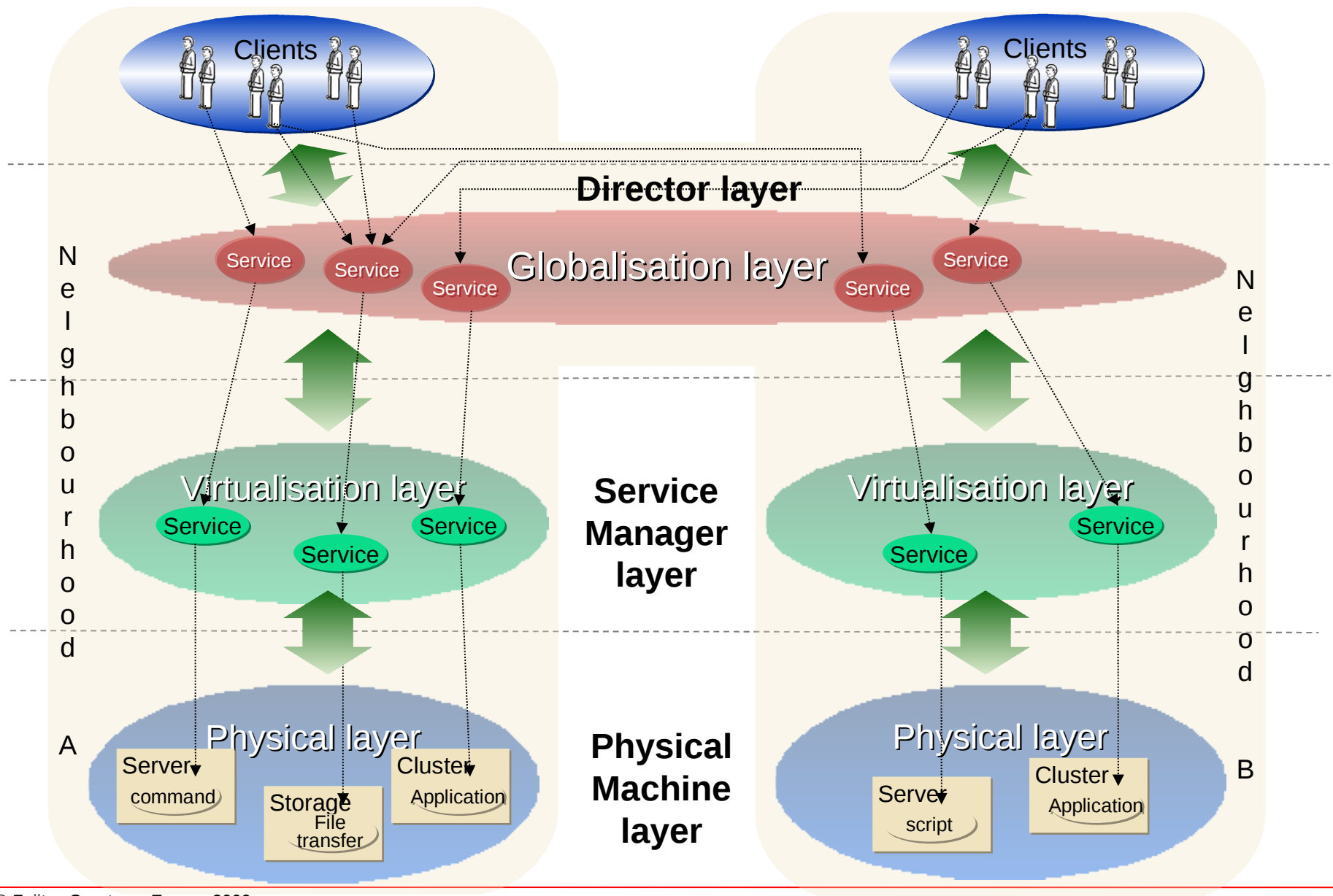
Virtualized resources

- Applications
 - Service definitions encapsulate applications

- Hosts where services are provided
 - Independence of location
 - Location is hidden from users

- Data locality
 - Workspace area used by Director
 - Run directory on Service Managers
 - Data directories on Service Managers

Global Virtualisation architecture



Services – What they describe

- Services encapsulate applications
 - It defines an application plus a set of actions that can be applied to it
- Actions describe a unit of work available within the service (this becomes a workflow task)

e.g.

- The basic action is to “run” an application, but other actions like “get status”, “list files”, “check convergence” can be built as necessary
- Describes how it can be executed (interactive, batch)
- Includes the User Interface specification for each action
 - Dynamically built in the users client desktop
 - Easily modified when adding/changing actions
 - Allows customisation for application parameters

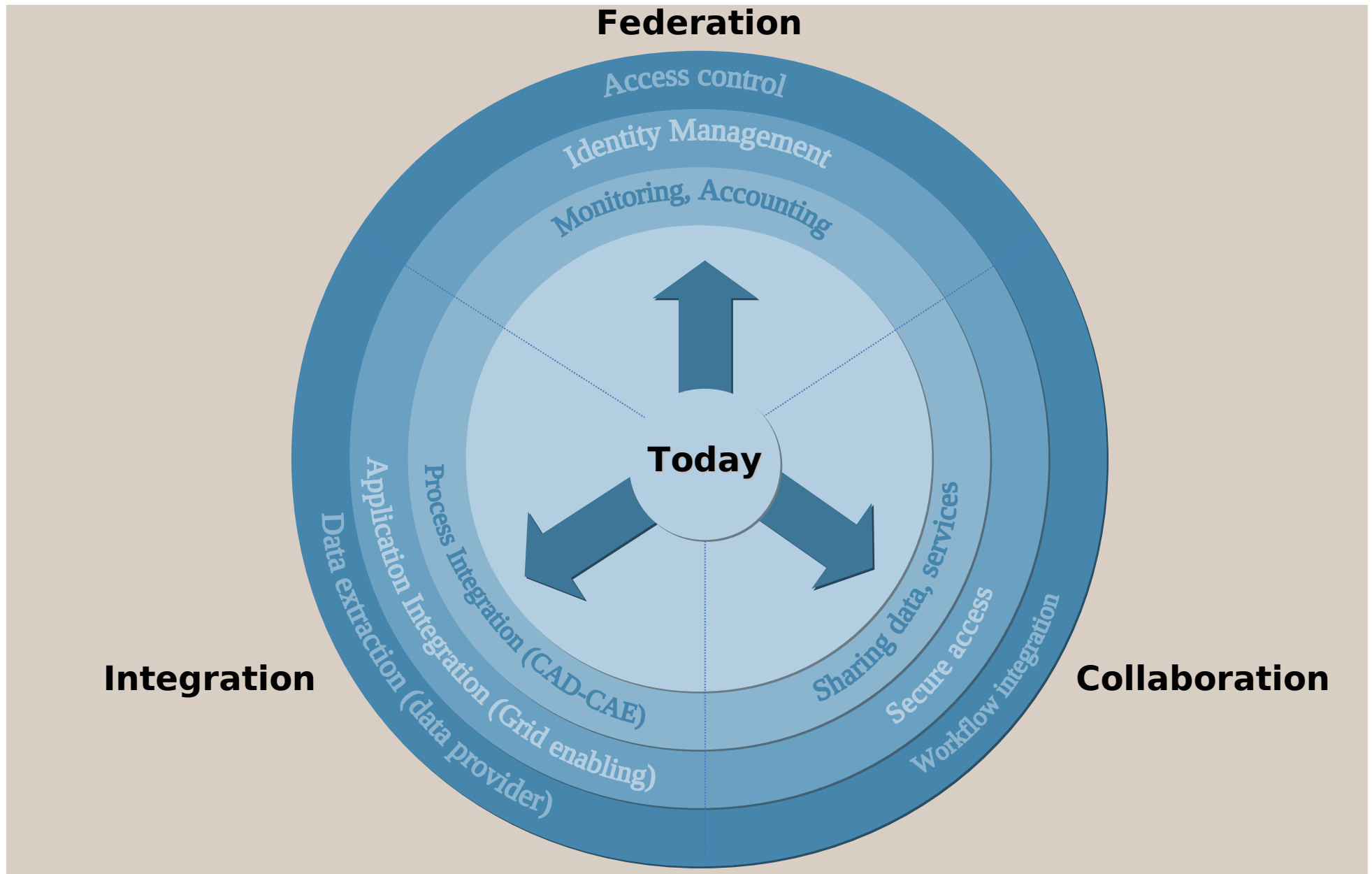
Services - features

- Service Managers publish services to the SynfiniWay Director
- The SynfiniWay Director enables service usage to authorised users
- Services can be defined on multiple Service Managers
- The same service can be implemented differently for different Service Managers
 - Example
 - One uses LSF another uses PBS – to the user it is the same service
 - Actions available on one Service Manager may not be available on another

Growing SynfiniWay



SynfiniWay enhancement direction



Planned Improvements

- **Workflow**
 - meta-scheduler extension
 - multi-user access to running workflows
- **User Groups**
 - better identity management
 - notion of roles and group of users with attached access rights
- **Service**
 - service definition simplification
 - service publisher
 - WEB-Service support
- **API**
 - standardized SynfiniWay integration
 - public API to access SynfiniWay
- **Monitoring**
 - distributed monitoring facility
 - global supervision of the GRID with incident diagnostic aid
- **Accounting**
 - events storage / retrieval tools
 - global accounting model, project and cost oriented

Framework Monitoring

The screenshot displays the SynfiniWay Monitoring web interface. The browser address bar shows the URL `http://10.140.9.248:8080/monitoringWebClient/operator.html#`. The interface includes a navigation menu on the left with options like 'Servers Graph View', 'Servers Grid View', and 'Monitoring Logs'. The main area features a 'Servers Graph View' showing a network topology with nodes for 'JAPAN', 'FRANCE', and 'USA'. Each node is connected to several server instances, such as 'BA.AM(UP)', 'FR.SM(UP)', and 'USA.AM.2071(UP)'. A 'SUMMARY' panel on the left indicates the community status is 'OK'. On the right, a 'MONITORING EVENTS' panel shows zero critical, warning, or informational events. The bottom of the interface includes 'Events' and 'Statistics' tabs and a copyright notice for Fujitsu Systems Europe.

Future directions to be considered

- ***Data grid, Data ontology***

- Enriching external data access capabilities
- Meta-data management
- Efficient data transfers
 - Data replication
 - Data cache
 - Data dictionary
- Data “explorer” browser

- ***Banking and brokering***

- Budget management
- Brokering and bidding for services

Is SynfiniWay a Cloud Computing solution ?

- What « cloud computing » means ?
 - The majority of cloud computing infrastructure consists of reliable services delivered through data centers and built on servers with different levels of virtualization technologies
 - The services are accessible from anywhere, with The Cloud appearing as a single point of access for all the computing needs of consumers
 - Commercial offerings need to meet the quality of service requirements of customers and typically offer service level agreement

As a matter of fact, Cloud Computing is SynfiniWay !

